Data Evaluation Report on the Chronic Toxicity of BAS 183 WB H (Soluble Liquid Formulation Containing 48.41% ai) to Freshwater Invertebrates - *Daphnia magna*.

PMRA Submission Number {.....} EPA MRID No. 48718007

Data Requirement:	PMRA Data Code	{.....}
	EPA DP Barcode	402518
	OECD Data Point	{.....}
	EPA MRID	48718007
	EPA Guideline	850.1300

Test material: BAS 183 WB H **Purity:** 48.41% ai
Common name: Dicamba BAPMA Salt
Chemical name: IUPAC:
CAS name: N,N-bis(3-aminopropyl)methylamine
CAS No.: 105-83-9 (ai)
Synonyms: BAS 183 H LVF, BAAS 183 22 H, BAPMA Dicamba Salt

Primary Reviewer: David A. McEwen **Signature:** David A. McEwen
Staff Scientist, CSS-Dynamac Corporation **Date:** 11/21/12

Secondary Reviewer: Mia Howard **Signature:** Mia Howard
Environmental Scientist, CDM Smith **Date:** 01/24/13

Primary Reviewer: Elizabeth Donovan, Biologist **Date:** 9/7/2016
EPA/EFED/ERB 6

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Reference/Submission No. {.....}

Company Code	{.....}	[For PMRA]
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Use Site Category	{.....}	[For PMRA]
EPA PC Code	100094	

Date Evaluation Completed: 11-3-2016

CITATION: Nierzedska, E. 2011. BAS 183 WB H – *Daphnia magna* Reproduction Test. Unpublished study performed by Department of Ecotoxicology, Institute of Industrial Organic Chemistry, Pszczyna, Poland. Laboratory Project ID: W/05/11. Study sponsored by BASF SE, Crop Protection Division, Agricultural Center Limburgerhof, Germany. Study initiated April 30, 2011 and completed December 21, 2011.

DISCLAIMER: This document provides guidance for EPA and PMRA reviewers on how to complete a data evaluation record after reviewing a scientific study concerning the chronic toxicity of a pesticide to freshwater invertebrates. It is not intended to prescribe conditions to any external party for conducting this study nor to establish absolute criteria regarding the assessment of whether the study is scientifically sound and whether the study satisfies any applicable data requirements. Reviewers are expected to review and to determine for each study, on a case-by-case basis, whether it is scientifically sound and provides sufficient information to satisfy applicable data requirements. Studies that fail to meet any of the conditions may be accepted, if appropriate; similarly, studies that meet all of the conditions may be rejected, if appropriate. In sum, the reviewer is to take into account the totality of factors related to the test methodology and results in determining the acceptability of the study.

EXECUTIVE SUMMARY:

The 21-day-chronic toxicity of BAS 183 WB H (a soluble liquid formulation containing 48.41% dicamba BAPMA salt) to *Daphnia magna* was studied under static-renewal conditions. Daphnids were exposed to BAS 183 WB H at nominal concentrations of 0 (negative control), 18.6, 24.2, 31.4, 40.8, 53.1, 69, and 90 mg/L. Time-weighted mean-measured concentrations were <0.005 (<LOD, control), 8.6, 12, 15, 20, 25, 33, and 43 mg ai/L, equivalent to <LOD (control), 18, 24, 31, 40, 52, 69, and 89 mg formulation/L. No treatment-related effects were observed on adult survival, reproduction (age of first brood release, number of offspring per surviving adult, and intrinsic rate of population increase), or growth (length). The overall NOAEC and LOAEC values were 89 and >89 mg/L (43 and >43 mg ai/L, respectively), respectively, based on time-weighted mean-measured concentrations.

This study is classified as scientifically sound and satisfies guideline requirements for a chronic toxicity study with freshwater invertebrates.

Results Synopsis

Test Organism Age (eg. 1st instar): neonates, <24 hours old
Test Type (Flow-through, Static, Static-Renewal): static-renewal (unaerated)

Time-weighted mean-measured/total formulation:

21-day EC_{50} (immobility/survival): >89 mg/L 95% C.I.: N/D

NOAEC: 89 mg/L
LOAEC: >89 mg/L

Time-weighted mean-measured/ai (dicamba salt):

21-day EC_{50} (immobility/survival): >43 mg ai/L 95% C.I.: N/D

NOAEC: 43 mg ai/L
LOAEC: >43 mg ai/L

Time-weighted mean-measured/ ae (dicamba acid)

21-day EC_{50} (immobility/survival): >42 mg ae/L 95% C.I.: N/D

NOAEC: 42 mg ae/L
LOAEC: >42 mg aieL

Endpoint(s) affected: None

I. MATERIALS AND METHODS

GUIDELINE FOLLOWED: This study was conducted following guidelines outlined in the OECD Guidelines for Testing of Chemicals, No. 211 (1998).

There were no notable deviations from U.S. EPA OPPTS 850.1300 guidance.

COMPLIANCE: Signed and dated GLP, Quality Assurance, and No Data Confidentiality claims statements were provided. This study was conducted in accordance with GLP Standards as published by the U.S. EPA in 40 CFR Part 160 excluding conduct of the preliminary studies.

A. MATERIALS:

1. Test Material BAS 183 WB H [soluble liquid (SL) formulation]

Description: Pale brown liquid

Lot No./Batch No. : 1732-10

Purity: 48.41% ai

Stability of compound under test conditions: The stability of BAS 183 WB H in dilution water was demonstrated by regular analysis of fresh and aged solutions throughout the study. Measured concentrations ranged from 80.7 to 102.6% of nominal levels.

Storage conditions of Test chemicals: Room temperature in the dark

Physicochemical properties of dicamba.

Parameter	Values	Comments
Water solubility	>250 g/L	At pH 6.8
Vapor pressure	1.67 mPa	At 25°C
UV absorption	Not reported	
pKa	Not reported	
Kow	logKow = -1.8	At pH 6.8 and 25°C

2. Test Organism:

Species: *Daphnia magna* STRAUS, <24 hours old
EPA and OECD recommend Daphnia magna

Age of the parental stock: Not reported
EPA recommends that young daphnids ≤24 hours old from a separate parental culture be used

Source: Laboratory cultures

EPA requires all test organisms must be produced from laboratory reared culture that has been maintained for at least 21 days at test conditions in dilution water with renewal of the culture medium at least three times per week.

B. STUDY DESIGN:

1. Experimental Conditions

a. Range-finding Study: The test concentrations were selected based on the results of four preliminary tests. In the first acute immobilization test, *Daphnia magna* (20/concentration) were exposed to BAS 183 WB H at nominal concentrations of 10 to 100 mg/L. After 48 hours exposure, 60% of the animals at 100 mg/L were immobilized. In the second acute immobilization test, *Daphnia magna* (20/concentration) were exposed to nominal concentrations of 18 to 320 mg/L. After 24 hours exposure, 25 to 80% of the animals at 180 and 320 mg/L were immobilized. After 48 hours exposure, 45 to 100% of the animals at 100 to 320 mg/L were immobilized. In the first 21-day reproduction study, *Daphnia magna* (10/concentration) were exposed to nominal concentrations of 2.4 to 56 mg/L. No toxic effects on the number of offspring produced per surviving adult or mean adult length were observed at any concentration. The high-dose group (56 mg/L) averaged 60.8 offspring/surviving adult compared to 66.7 offspring/surviving adult in the controls. In the second reproduction study, *Daphnia magna* (10/concentration) were exposed to nominal concentrations of 0 and 100 mg/L. At 100 mg/L, 60% of the adult animals were immobilized. No toxic effects on the number of offspring produced per surviving adult or mean adult length were observed at either concentration. The100 mg/L group averaged 51.7 offspring/surviving adult compared to 54.3 offspring/surviving adult in the controls.

b. Definitive Study

Table 1: Experimental Parameters

Parameter	**Details**	**Remarks** / ***Criteria***
Parental acclimation:		The age of the parental daphnids was not reported; however, it was stated that the animals used in the study were not first brood progeny.
Period:	Not reported	
Conditions (same as test or not):	Generally same as test	
Feeding:	Fed daily with the green algae (*Pseudokirchneriella subcapitata*) and occasionally supplemented with *Spirulina maxima* to provide vitamins of group B and micronutrients.	*EPA recommends that prior to testing, daphnids that are at least 10-12 days old (those that have had at least one brood) should be separated from the culture, put in separate container and maintained for at least 21 days to insure that good health conditions are present*
Health (any mortality observed):	No ephippia were present	

Parameter	Details	Remarks *Criteria*
Test condition: Static renewal/flow-through: Type of dilution system- for flow through method: Renewal rate for static renewal:	Static renewal N/A Every Monday, Wednesday, and Friday	*(EPA requires consistent flow rate of 5-10 vol/24 hours, meter systems calibrated before study and checked twice daily during test period)*
Aeration, if any:	None	*EPA recommends test chambers should not be aerated*
Duration of the test:	21 days	*Recommended duration is 21 days.*
Test vessel: Material (glass/stainless steel): Size (for growth and reproduction/survival test): Fill volume:	Glass 150 mL 90 mL	*1. Recommended Material: Glass, No. 316 stainless steel, or perfluorocarbon plastics* *2. Recommended Size: 250 ml with 200 ml fill volume; 100 ml with 80 ml fill volume* *OECD guideline recommends that parent animals be maintained individually; one per vessel, with 50 - 100 ml of medium in each vessel.*
Source of dilution water:	Elendt M7 medium was prepared by adding stock solutions of reagent-grade chemicals to de-ionized water. The dilution water was aerated prior to use.	*Recommended source of dilution water includes unpolluted well or spring water that has been tested for contaminants, or appropriate reconstituted water (see ASTM for details).*

Parameter	Details	Remarks *Criteria*
Water parameters: Hardness: pH: Dissolved oxygen: Temperature: Total Organic Carbon: Particulate matter: Metals: Pesticides: Chlorine: Frequency of measurements:	 170.4 to 219.5 mg/L as $CaCO_3$ 7.56 to 7.88 8.2 to 9.5 mg/L 19.9 to 22.4°C Not reported Not reported Not reported Not reported Not reported Dissolved oxygen and pH were measured at all levels three times per week at each solution renewal (both old and new solutions). Temperature was continuously monitored in a surrogate vessel. Hardness was measured once per week in both fresh and spent solutions at all concentrations.	***Recommended hardness:*** *160 to 180 mg/L as $CaCO_3$; OECD recommends > 140 mg/L as $CaCO_3$* ***Recommended pH:*** *7.6 to 8.0 pH should not deviate by more than 1.0 unit for more than 48 hours. OECD recommends that pH range be 6 - 9 and does not vary more than 1.5 units in any one test.* ***Recommended dissolved oxygen:*** *renewal should not drop below 50% for more than 48 hours.* *Recommended flow-through: ∃ 60% throughout test.* ***Recommended temperature:*** *20°C ± 2°C.; should not deviate from 20°C by more than 5°C for more than 48 hours. OECD recommends a range of 18 - 22°C; temperature should not vary more than ± 2°C* *OECD guideline recommends that total organic carbon < 2 mg/L*
Number of replicates: For growth and reproduction: For survival test:	 10 replicates per level (Same)	*Number of replicates should include a control(s) and at least 5 test concentrations; dilution factor should not be greater than 50%.* *OECD recommends that at least 5 test concentrations be used in a geometric series with a separation factor not exceeding 3.2.*
Number of organisms: For growth and reproduction: For survival test:	 1 daphnia per replicate (Same)	*Recommended number of organisms include 22 daphnids/test concentration; 7 test chambers should contain 1 daphnid each, and 3 test chambers contain 5 daphnids each.* *OECD recommends holding a minimum of 10 daphnids individually for static tests.* *For flow-through tests, 40 animals should be divided into 4 groups of 10 animals at each test concentration.*

Parameter	Details	Remarks *Criteria*
Treatment Concentrations: Nominal (formulation): Nominal (ai): Time-weighted mean measured (ai): Time-weighted mean measured (formulation):	0 (negative control), 18.6, 24.2, 31.4, 40.8, 53.1, 69.0, and 90.0 mg/L 0 (negative control), 9.00, 11.72, 15.20, 19.75, 25.71, 33.40, and 43.40 mg ai/L <0.005 (<LOD, control), 8.6, 11.7, 15.0, 19.6, 25.4, 33.2, and 43.2 mg ai/L <LOD (control), 17.69, 24.16, 30.92, 40.47, 52.24, 68.61, and 89.32 mg/L	Although analytical variation was minimal (<±20%) for all levels, the results were expressed in terms of time-weighted mean concentrations as per the Sponsor's request. From the measured dicamba (ai) concentrations, time-weighted mean measured concentrations in terms of total formulation were also calculated.
Solvent (type, percentage, if used)	NA	*Solvent concentration should not exceed 0.5 ml/L for static tests or 0.1 ml/L for flow-through tests. Recommended solvents include dimethylformamide, triethylene glycol, methanol, acetone and ethanol. OECD recommends #0.1 ml/L of solvent.*
Lighting:	16 hours light/8 hours dark Averaged intensity of 693 lux	Light intensity was measured two or three times per week during the test. *Recommended photoperiod is 16 hours light and 8 hours of dark.*
Recovery of the chemical: Frequency of determination: Limit of Quantification: Limit of Detection:	Fresh: 93.6 to 102.5% Aged: 80.7 to 102.6% Days 0, 2, 5, 7, 14, and 21 0.01 mg ai/L 0.005 mg ai/L	Water samples were analyzed for BAS 183 WB H using HPLC with UV-VIS detection. The LOD was erroneously reported to be 0.005 g/L on p. 22 of the study report. It was presumed by the reviewer that the correct units were mg/L.
Positive control {if used, indicate the chemical and concentrations} :	Not reported	

Parameter	Details	Remarks *Criteria*
Other parameters, if any Feeding:	At the start of the test and each subsequent renewal event, fresh solutions were supplied with algae suspension in the amount sufficient to provide 0.2 mg TOC/daphnid/day.	

2. Observations:

Table 2: Observations

Parameters	Details	Remarks *Criteria*
Data endpoints measured (list)	-Parental survival/immobility -First day of reproduction -Number of young produced per surviving female -Intrinsic rate of population growth -Length of surviving adults	Dry weight was not recorded *Recommended endpoints measured:* *- Survival of first-generation daphnids,* *- Number of young produced per female,* *- Dry weight (required) and length (optional) of each first generation daphnid alive at the end of the test,* *- Observations of other effects or clinical signs.*
Observation intervals	Daily	
Were raw data included?	Yes	
Other observations, if any	None reported	

II. RESULTS AND DISCUSSION

A. MORTALITY AND SUBLETHAL EFFECTS:

Adult survival was 100% in the controls and all test concentration during the study. The 21-day EC_{50} for immobilization was >89 mg/L, and the NOAEC and LOAEC values were nominally 89 and >89 mg/L, respectively, based on time-weighted mean measured concentrations (total formulation).

Mean lengths of surviving daphnia ranged from 2.78 to 2.90 mm in all groups, including the control. The 21-day EC_{50} for growth (i.e., length) was >89 mg/L, and the NOAEC and LOAEC values were nominally 89 and >89 mg/L, respectively, based on time-weighted mean measured concentrations (total formulation).

B. EFFECT ON REPRODUCTION:

For all levels (including the control), the time to first brood release averaged 8.8 to 9.6 days and the mean number of offspring per surviving adult ranged from 61.1 to 83.4, with no statistically-significant differences indicated at any level for either parameter.

The intrinsic rate of population increase (r) was 0.317/day for the control level, and ranged from 0.326 to 0.353/day for all treatment levels, with no statistically-significant differences from the control indicated.

For all (reproductive) endpoints, the EC_{50} was >89 mg/L, and the NOAEC and LOAEC values were 89 and >89 mg/L, respectively, using time-weighted mean concentrations (total formulation).

Table 3: Effect of BAS 183 WB H on Growth, Reproduction, and Survival of *Daphnia magna*.[a]

Treatment TWA (and Nominal) Concentrations (mg/L)	Adult Survival (%)	Age of First Brood Release (Day ± SD)	Total Live Young/ Surviving Female (No. ± SD)	Adult Length (mm ± SD)[b]
Negative Control	100	9.6 ± 0.74	61.1 ± 7.95	2.78 ± 0.11
18 (18.6)	100	9.2 ± 0.95	83.4 ± 12.97	2.88 ± 0.08
24 (24.2)	100	9.6 ± 1.10	66.6 ± 11.40	2.78 ± 0.14
31 (31.4)	100	9.2 ± 0.48	69.9 ± 10.59	2.81 ± 0.13
40 (40.8)	100	9.1 ± 0.97	82.2 ± 14.85	2.87 ± 0.10
52 (53.1)	100	9.2 ± 0.48	73.7 ± 9.37	2.87 ± 0.08
69 (69.0)	100	9.3 ± 0.92	79.5 ± 17.70	2.90 ± 0.09
89 (90.0)	100	8.8 ± 0.48	77.2 ± 13.39	2.81 ± 0.10
NOAEC (mg/L)	89	89	89	89
LOAEC (mg/L)	>89	>89	>89	>89

[a] Data were obtained from Tables 13 and 22 on pages 40 and 49 of the study report.
[b] Data were obtained from statistical output table on page 67 of the study report.

C. REPORTED STATISTICS:

Statistical Method: Endpoints that were statistically analyzed were immobilization of parent animals, age at first brood release, cumulative offspring per surviving adult, intrinsic rate of population increase (r), and adult length. All statistical analyses were performed using ToxRat Professional 2.10 and reported in terms of time-weighted mean-measured formulation concentrations.

Data from each endpoint were assessed for normal distribution using the Shapiro-Wilk's Test and for homogeneity of variance using Levene's Test, and were then subjected to Williams Multiple Sequential t-test Procedure ($\alpha = 0.05$). NOAEC and LOAEC values were assigned based on significance.
The EC_x for each response was determined through the use of probit analysis using linear maximum likelihood

regression.

Survival/immobility
EC_{50} (21 d): >89 mg/L 95% C.I.: N/D
NOAEC: 89 mg/L
LOAEC: >89 mg/L

Age at first observed reproduction
NOAEC: 89 mg/L
LOAEC: >89 mg/L

Number of young/surviving adult
EC_{50} (21 d): >89 mg/L 95% C.I.: N/D
NOAEC: 89 mg/L
LOAEC: >89 mg/L

Intrinsic rate of population growth
EC_{50} (21 d): >89 mg/L 95% C.I.: N/D
NOAEC: 89 mg/L
LOAEC: >89 mg/L

Length
EC_{50} (21 d): >89 mg/L 95% C.I.: N/D
NOAEC: 89 mg/L
LOAEC: >89 mg/L

Endpoint(s) affected: None

D. VERIFICATION OF STATISTICAL RESULTS:

Statistical Method(s): The reviewer assessed the endpoints for survival/immobility, age at first observed reproduction, intrinsic rate of growth, number of young/surviving adult, and adult length. Due to the overall lack of immobility in both the control and treatment groups, the EC50, NOAEC, and LOAEC values based on survival/immobility were empirically determined. The intrinsic rate of growth data were visually assessed based on the mean values for each test level, as no raw data were provided. The reviewer statistically analyzed the day of first observed reproduction (see Reviewer's Comments for calculation of the raw data), number of young/surviving adult, and adult length data using Toxstat 3.5 statistical software. These data were assessed for normality and homogeneity of variance using Chi-square and Levene's tests, respectively. The age at first observed reproduction data met the assumption of homogeneity of variance, but not normality. Log base 10 transformation of the data corrected the issue of normality and therefore transformed age at first observed reproduction data were analyzed using ANOVA followed by Dunnett's test. The number of young/surviving adult and adult length data met all assumptions of normality and homogeneity without transformation and were therefore analyzed, untransformed, using ANOVA followed by Dunnett's tests. The toxicity values are reported in terms of time-weighted mean formulation concentrations.

Survival/immobility
EC_{50} (21 d): >89 mg/L 95% C.I.: N/D
NOAEC: 89 mg/L
LOAEC: >89 mg/L

Age at first observed reproduction
NOAEC: 89 mg/L

LOAEC: >89 mg/L

Number of young/surviving adult
NOAEC: 89 mg/L
LOAEC: >89 mg/L

Intrinsic rate of population growth
NOAEC: 89 mg/L
LOAEC: >89 mg/L

Length
NOAEC: 89 mg/L
LOAEC: >89 mg/L

E. STUDY DEFICIENCIES:

There were no significant deviations or deficiencies from OCSPP 850.1300 guidance.

F. REVIEWER'S COMMENTS:

The reviewer's results agreed with those of the study author. In the Executive Summary and Conclusions sections of the DER, results were provided in terms of time-weighted mean measured concentrations, as mg ai (dicamba)/L and mg (formulation)/L. Results were rounded to two significant figures.

All validity requirements were met. Specifically, 1) ≤20% of the control organisms appeared to be immobilized, stressed, or diseased during the test; 2) each surviving control daphnid produced an average of >60 young; and 3) no ephippia were produced by control animals.

The reviewer calculated the raw age of first reproduction data using the values in Table 14 through 21 of the study report. The reviewer extracted the day of first reproduction raw data from these tables and then added 0.5 day to each individual value. It appears that the study author assumed that each daphnid was 0.5 day old at test initiation (day 0) of the test, based on the means reported on page 68 of the study report . By adding 0.5 to each day of first reproduction, the reviewer was able to calculate mean (±SD) age of first reproduction values that matched those reported by the study author.

The intrinsic rate of population growth (r) integrates results of reproductive output and age-specific mortality; the units for (r) are 1/day. The formula for calculation of (r) was not reported and replicate data were not reported. Therefore, the reviewer analyzed the endpoints for intrinsic rate of population growth visually, based on the mean values provided by the study author on page 70 of the study report. Because stimulation of the mean growth rate was observed at all test levels relative to the negative control, the reviewer determined that there were no adverse effects.

The in-life study dates were May 4 to May 25, 2011.

G. CONCLUSIONS:

This study is scientifically sound and is thus acceptable. No treatment-related effects were observed on adult survival, reproductive parameters, or growth (length).

Time-weighted mean-measured/total formulation:

21-day EC_{50} (immobility/survival): >89 mg/L 95% C.I.: N/D

NOAEC: 89 mg/L
LOAEC: >89 mg/L

Time-weighted mean-measured/ai (dicamba):

21-day EC_{50} (immobility/survival): >43 mg ai/L 95% C.I.: N/D

NOAEC: 43 mg ai/L
LOAEC: >43 mg ai/L

Time-weighted mean-measured/ ae (dicamba acid)

21-day EC_{50} (immobility/survival): >42 mg ai/L 95% C.I.: N/D

NOAEC: 42 mg ai/L
LOAEC: >42 mg ai/L

Endpoint(s) affected: None

III. REFERENCES:

OECD. 2008 (October 3). OECD Guideline for Testing of Chemicals No. 211 "*Daphnia magna* Reproduction Test".

Directive 2001/59/EC, Appendix No V, Part C: C.20."*Daphnia magna* reproduction test".

OECD. 1997. OECD Environmental Health and Safety Publications, Series on Testing and Assessment, No. 6, "Report of the Final Ring Test of the Daphnia magna Reproduction Test", Environment Directorate. Paris.

ToxRat Professional ver. 2.10.

Directive 2004/10/EC on the harmonization of laws, regulations and administrative provisions relating to the application of the principles of good laboratory practice and the verification of their applications for tests on chemical substances (codified version).

Polish legislation: regulation of the Minister of Health of June 03, 2003, Dz. U. No.116, Poz.1103, regulation of the Minister of Health of 28th May 2010 concerning the criteria that must be met by institutions conducting tests of chemical substances and preparations, and the verification of compliance with these criteria (Dz.U. Nr 109, poz. 722).

PN-EN ISO 6059 : 1999 Water quality – Determination of the sum of calcium and magnesium – EDTA titrimetric method

OECD Guideline for Testing of Chemicals No 211 (1998): '*Daphnia* sp. reproduction test' Annex No. 6. The calculations of the time –weighted mean.

APPENDIX I. OUTPUT OF REVIEWER'S STATISTICAL VERIFICATION

```
Title:  Dicamba chronic daphnid age at first reproduction
File:             8007b             Transform:                LOG BASE 10(Y)

                      Chi-Square Test for Normality
------------------------------------------------------------------------------

                      Actual and Expected Frequencies

INTERVAL     <-1.5     -1.5 to <-0.5     -0.5 to 0.5    >0.5 to 1.5    >1.5
             -----     -------------     -----------    -----------    -----
EXPECTED    5.3600       19.3600           30.5600        19.3600     5.3600
OBSERVED     1            31                25             17          6

------------------------------------------------------------------------------

     Chi-Square =  11.9207             (p-value = 0.0180)

     Critical Chi-Square   = 13.277  (alpha = 0.01 , df = 4)
                           =  9.488  (alpha = 0.05 , df = 4)

------------------------------------------------------------------------------

Data PASS normality test (alpha = 0.01). Continue analysis.


Title:  Dicamba chronic daphnid age at first reproduction
File:             8007b             Transform:                LOG BASE 10(Y)

                  Levene's Test for Homogeneity of Variance

                               ANOVA Table
------------------------------------------------------------------------------

   SOURCE             DF               SS               MS           F
------------------------------------------------------------------------------
   Between             7              0.0050           0.0007       0.7993

   Within (Error)     72              0.0647           0.0009
------------------------------------------------------------------------------
   Total              79              0.0697
------------------------------------------------------------------------------
                                                      (p-value = 0.5905)

   Critical F  = 2.8983  (alpha = 0.01, df = 7,72)
               = 2.1397  (alpha = 0.05, df = 7,72)

   Since  F < Critical F  FAIL TO REJECT  Ho: All equal (alpha = 0.01)

Title:  Dicamba chronic daphnid age at first reproduction
File:             8007b             Transform:             NO TRANSFORMATION

                               ANOVA Table
------------------------------------------------------------------------------
```

SOURCE	DF	SS	MS	F
Between	7	4.8000	0.6857	1.0686
Within (Error)	72	46.2000	0.6417	
Total	79	51.0000		

(p-value = 0.3924)

Critical F = 2.8983 (alpha = 0.01, df = 7,72)
= 2.1397 (alpha = 0.05, df = 7,72)

Since F < Critical F FAIL TO REJECT Ho: All equal (alpha = 0.05)

Title: Dicamba chronic daphnid age at first reproduction
File: 8007b Transform: NO TRANSFORMATION

Dunnett's Test - TABLE 1 OF 2 Ho:Control>Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	TRANS T STAT	SIG 0.05
1	neg control	9.6000	9.6000		
2	18	9.2000	9.2000	-1.1166	
3	24	9.6000	9.6000	0.0000	
4	31	9.2000	9.2000	-1.1166	
5	40	9.1000	9.1000	-1.3957	
6	52	9.2000	9.2000	-1.1166	
7	69	9.3000	9.3000	-0.8374	
8	89	8.8000	8.8000	-2.2332	

Dunnett critical value = 2.4000 (1 Tailed, alpha = 0.05, df [used] = 7,60)
(Actual df = 7,72)

Title: Dicamba chronic daphnid age at first reproduction
File: 8007b Transform: NO TRANSFORMATION

Dunnett's Test - TABLE 2 OF 2 Ho:Control>Treatment

GROUP	IDENTIFICATION	NUM OF REPS	MIN SIG DIFF (IN ORIG. UNITS)	% OF CONTROL	DIFFERENCE FROM CONTROL
1	neg control	10			
2	18	10	999.9999	0.0	-0.4000
3	24	10	999.9999	0.0	-0.0000
4	31	10	999.9999	0.0	-0.4000
5	40	10	999.9999	0.0	-0.5000
6	52	10	999.9999	0.0	-0.4000
7	69	10	999.9999	0.0	-0.3000
8	89	10	999.9999	0.0	-0.8000

NOTE: MSD = 999.9999 means actual MSD estimate > 999.

Title: Dicamba chronic daphnid offspring/surviving adult
File: 8007r Transform: NO TRANSFORMATION

Chi-Square Test for Normality

Actual and Expected Frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	5.3600	19.3600	30.5600	19.3600	5.3600
OBSERVED	5	21	27	22	5

Chi-Square = 0.9620 (p-value = 0.9155)

Critical Chi-Square = 13.277 (alpha = 0.01 , df = 4)
= 9.488 (alpha = 0.05 , df = 4)

Data PASS normality test (alpha = 0.01). Continue analysis.

Title: Dicamba chronic daphnid offspring/surviving adult
File: 8007r Transform: NO TRANSFORMATION

Levene's Test for Homogeneity of Variance

ANOVA Table

SOURCE	DF	SS	MS	F
Between	7	697.5500	99.6500	1.5553
Within (Error)	72	4613.0000	64.0694	
Total	79	5310.5500		

(p-value = 0.1628)

Critical F = 2.8983 (alpha = 0.01, df = 7,72)
= 2.1397 (alpha = 0.05, df = 7,72)

Since F < Critical F FAIL TO REJECT Ho: All equal (alpha = 0.01)

Title: Dicamba chronic daphnid offspring/surviving adult
File: 8007r Transform: NO TRANSFORMATION

ANOVA Table

SOURCE	DF	SS	MS	F
Between	7	4338.4000	619.7714	3.8896
Within (Error)	72	11472.4000	159.3389	
Total	79	15810.8000		

(p-value = 0.0012)

Critical F = 2.8983 (alpha = 0.01, df = 7,72)
= 2.1397 (alpha = 0.05, df = 7,72)

Since F > Critical F REJECT Ho: All equal (alpha = 0.05)

Title: Dicamba chronic daphnid offspring/surviving adult
File: 8007r Transform: NO TRANSFORMATION

Dunnett's Test - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG 0.05
1	neg control	61.1000	61.1000		
2	18	83.4000	83.4000	-3.9503	
3	24	66.6000	66.6000	-0.9743	
4	31	69.9000	69.9000	-1.5589	
5	40	82.2000	82.2000	-3.7377	
6	52	73.7000	73.7000	-2.2320	
7	69	79.5000	79.5000	-3.2594	
8	89	77.2000	77.2000	-2.8520	

Dunnett critical value = 2.4000 (1 Tailed, alpha = 0.05, df [used] = 7,60)
(Actual df = 7,72)

Title: Dicamba chronic daphnid offspring/surviving adult
File: 8007r Transform: NO TRANSFORMATION

Dunnett's Test - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	MIN SIG DIFF (IN ORIG. UNITS)	% OF CONTROL	DIFFERENCE FROM CONTROL
1	neg control	10			
2	18	10	13.5484	22.2	-22.3000

3	24	10	13.5484	22.2	-5.5000
4	31	10	13.5484	22.2	-8.8000
5	40	10	13.5484	22.2	-21.1000
6	52	10	13.5484	22.2	-12.6000
7	69	10	13.5484	22.2	-18.4000
8	89	10	13.5484	22.2	-16.1000

Title: Dicamba chronic daphnid offspring/surviving adult
File: 8007r Transform: NO TRANSFORMATION

Chi-Square Test for Normality

Actual and Expected Frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	5.3600	19.3600	30.5600	19.3600	5.3600
OBSERVED	5	21	27	22	5

Chi-Square = 0.9620 (p-value = 0.9155)

Critical Chi-Square = 13.277 (alpha = 0.01 , df = 4)
= 9.488 (alpha = 0.05 , df = 4)

Data PASS normality test (alpha = 0.01). Continue analysis.

Title: Dicamba chronic daphnid offspring/surviving adult
File: 8007r Transform: NO TRANSFORMATION

Levene's Test for Homogeneity of Variance

ANOVA Table

SOURCE	DF	SS	MS	F
Between	7	697.5500	99.6500	1.5553
Within (Error)	72	4613.0000	64.0694	
Total	79	5310.5500		

(p-value = 0.1628)

Critical F = 2.8983 (alpha = 0.01, df = 7,72)
= 2.1397 (alpha = 0.05, df = 7,72)

Since F < Critical F FAIL TO REJECT Ho: All equal (alpha = 0.01)

Title: Dicamba chronic daphnid age at first reproduction
File: 8007b Transform: NO TRANSFORMATION

ANOVA Table

SOURCE	DF	SS	MS	F
Between	7	4.8000	0.6857	1.0686
Within (Error)	72	46.2000	0.6417	
Total	79	51.0000		

(p-value = 0.3924)

Critical F = 2.8983 (alpha = 0.01, df = 7,72)
= 2.1397 (alpha = 0.05, df = 7,72)

Since F < Critical F FAIL TO REJECT Ho: All equal (alpha = 0.05)

Title: Dicamba chronic daphnid age at first reproduction
File: 8007b Transform: NO TRANSFORMATION

Dunnett's Test - TABLE 1 OF 2 Ho:Control>Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	TRANS T STAT	SIG 0.05
1	neg control	9.6000	9.6000		
2	18	9.2000	9.2000	-1.1166	
3	24	9.6000	9.6000	0.0000	
4	31	9.2000	9.2000	-1.1166	
5	40	9.1000	9.1000	-1.3957	
6	52	9.2000	9.2000	-1.1166	
7	69	9.3000	9.3000	-0.8374	
8	89	8.8000	8.8000	-2.2332	

Dunnett critical value = 2.4000 (1 Tailed, alpha = 0.05, df [used] = 7,60)
(Actual df = 7,72)

Title: Dicamba chronic daphnid age at first reproduction
File: 8007b Transform: NO TRANSFORMATION

Dunnett's Test - TABLE 2 OF 2 Ho:Control>Treatment

	NUM OF	MIN SIG DIFF	% OF	DIFFERENCE

GROUP	IDENTIFICATION	REPS	(IN ORIG. UNITS)	CONTROL	FROM CONTROL
1	neg control	10			
2	18	10	999.9999	0.0	-0.4000
3	24	10	999.9999	0.0	-0.0000
4	31	10	999.9999	0.0	-0.4000
5	40	10	999.9999	0.0	-0.5000
6	52	10	999.9999	0.0	-0.4000
7	69	10	999.9999	0.0	-0.3000
8	89	10	999.9999	0.0	-0.8000

NOTE: MSD = 999.9999 means actual MSD estimate > 999.

Title: Dicamba chronic daphnid adult lenghths
File: 80071 Transform: NO TRANSFORMATION

Chi-Square Test for Normality

Actual and Expected Frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	5.3600	19.3600	30.5600	19.3600	5.3600
OBSERVED	6	17	33	20	4

Chi-Square = 0.9252 (p-value = 0.9209)

Critical Chi-Square = 13.277 (alpha = 0.01 , df = 4)
= 9.488 (alpha = 0.05 , df = 4)

Data PASS normality test (alpha = 0.01). Continue analysis.

Title: Dicamba chronic daphnid adult lenghths
File: 80071 Transform: NO TRANSFORMATION

Levene's Test for Homogeneity of Variance

ANOVA Table

SOURCE	DF	SS	MS	F
Between	7	0.0206	0.0029	0.5774
Within (Error)	72	0.3669	0.0051	
Total	79	0.3875		

(p-value = 0.7720)

Critical F = 2.8983 (alpha = 0.01, df = 7,72)
= 2.1397 (alpha = 0.05, df = 7,72)

Since F < Critical F FAIL TO REJECT Ho: All equal (alpha = 0.01)

Title: Dicamba chronic daphnid adult lenghths
File: 80071 Transform: NO TRANSFORMATION

ANOVA Table

SOURCE	DF	SS	MS	F
Between	7	0.1422	0.0203	1.7802
Within (Error)	72	0.8216	0.0114	
Total	79	0.9638		

(p-value = 0.1045)

Critical F = 2.8983 (alpha = 0.01, df = 7,72)
= 2.1397 (alpha = 0.05, df = 7,72)

Since F < Critical F FAIL TO REJECT Ho: All equal (alpha = 0.05)

Title: Dicamba chronic daphnid adult lenghths
File: 80071 Transform: NO TRANSFORMATION

Dunnett's Test - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG 0.05
1	neg control	2.7780	2.7780		
2	18	2.8600	2.8600	-1.7165	
3	24	2.7840	2.7840	-0.1256	
4	31	2.8140	2.8140	-0.7536	
5	40	2.8680	2.8680	-1.8840	
6	52	2.8720	2.8720	-1.9677	
7	69	2.9000	2.9000	-2.5538	
8	89	2.8100	2.8100	-0.6699	

Dunnett critical value = 2.4000 (1 Tailed, alpha = 0.05, df [used] = 7,60)
(Actual df = 7,72)

Title: Dicamba chronic daphnid adult lenghths

File: 80071 Transform: NO TRANSFORMATION

Dunnett's Test - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	MIN SIG DIFF (IN ORIG. UNITS)	% OF CONTROL	DIFFERENCE FROM CONTROL
1	neg control	10			
2	18	10	0.1147	4.1	-0.0820
3	24	10	0.1147	4.1	-0.0060
4	31	10	0.1147	4.1	-0.0360
5	40	10	0.1147	4.1	-0.0900
6	52	10	0.1147	4.1	-0.0940
7	69	10	0.1147	4.1	-0.1220
8	89	10	0.1147	4.1	-0.0320